Abstract No. crof542

XAS on $Sr_3FeMoO_{6.5}$ and $Sr_3FeNbO_{6.5}$

M. Croft, G. Veith, M. Greenblatt (Rutgers U.) K. V. Ramanujachary, J. Hattrick-Simpers, and S.E. Lofland (Rowan U.) I. Nowik (Hebrew U.)

Beamline(s): X19A, X18B

The observation of colossal magnetoresistance in mixed valent perovskite manganates has stimulated a substabtial transition metal oxide science. Recently the search for new materials has expanded to ordered double perovskites, such as Sr_2FeMoO_6. In analogy to the manganate field, we have extended such studies to lower dimensional layered perovskites, in this case $Sr_3FeTO_{7-\delta}$ (T=Mo and Nb), and have employed x-ray absorption spectroscopy (XAS) to probe the important charge balance in these materials. Figure 1 shows the Fe-K edges for these samples along with a series of Fe-standards. Despite the disparities of the edge-features between compounds, the coincidence of the T=Mo and Nb compound spectra, at the absorption coefficient of ~0.8 (see box in figure), with those of the Fe^{3+} standards is clear. Thus the Fe K-edge results indicate a nominal Fe^{3+} state for these materials. It is worth speculating that the increased intensity of the T=Nb sample spectrum (relative to that of T=Mo) in the A-feature and B-feature regions may be indicative of the lower average Fe valence in this material as evidenced by Mössbauer measurements in our group.

Figures 2 and 3 show the Mo and Nb L_3 edges for these $Sr_2TFeO_{6.5}$ materials along with a series of standard compounds. Since the A (B) features, in Figures 2 and 3, involve transitions into t_{2g} (e_g) final states, their relative intensity provides evidence as to the hole count in these orbitals. The relative A/B intensity, for our T = Mo compound, is intermediate between the Mo^{4+} and Mo^{6+} standards and very similar to the Mo^{5+} double perovskite $SrMo_{1/2}Fe_{1/2}O_3$ compound spectra. Thus the $Sr_2MoFeO_{6.5}$ material appears to be an essentially Mo^{5+} material. In analogy to the Mo spectra the very large A to B feature intensity ratio for the Nb-L_3 spectra in Figure 3 indicates a Nb^{5+} (d^0) state for the T = Nb material.

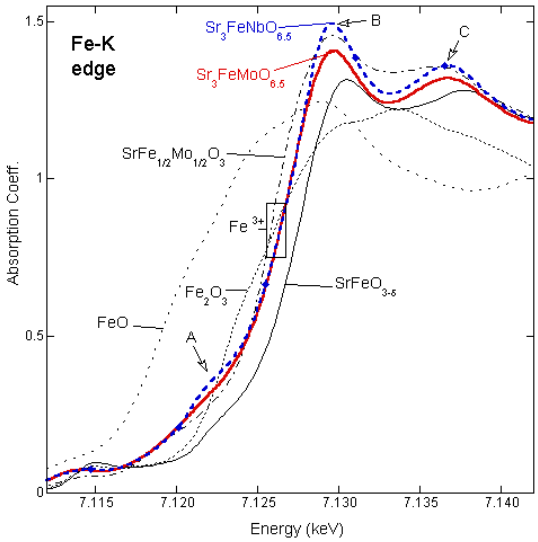

Figure 1.

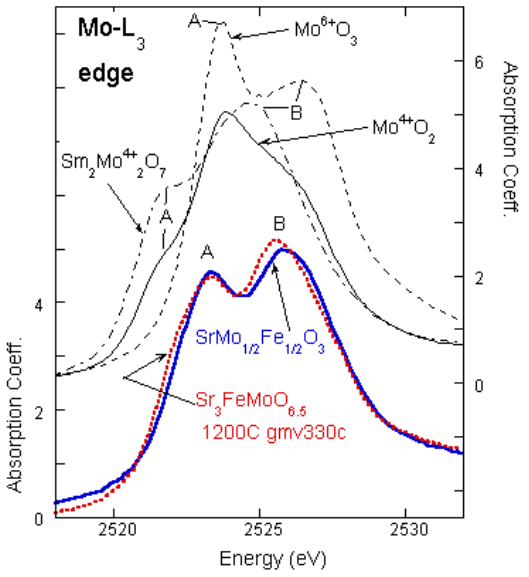

Figure 2.

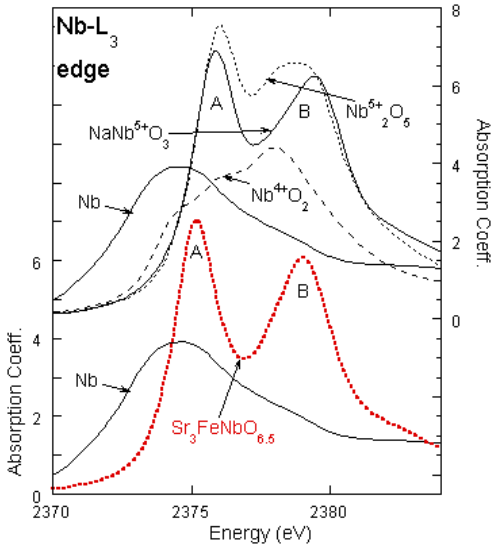

Figure 3.